

DATA EVALUATION REPORT

Reviewed by: Russell S. Jones, Ph.D. BPPD  
Secondary Reviewer: Freshteh Toghrol, Ph.D. BPPD



STUDY TYPE: Terrestrial Field Dissipation (Non-Guideline)

DP BARCODE: D278644

CASE No. 070603

SUBMISSION No.: S604428

PC CODE: 129087

TOX. CHEM. No.: None

MRID No: MRIDs 454892-01

TEST MATERIAL: Dially sulfide [TGA1 (No EPA File No.) and EP (EPA File Symbol No. 34704-IGI)]

STUDY Nos: DADS 01-01

SPONSOR: Platte Chemical Co., P. O. Box 667, Greeley, CO 80632-0667

TESTING FACILITY: Genesis Laboratories, Inc., 10122 N. E. Frontage Road, Wellington, CO 80549

TITLES OF REPORT: Dially Sulfides Dissipation in Soil

AUTHOR: Bruce D. Riggle, Ph.D.

REPORTS ISSUED: August 10, 2001

QUALITY ASSURANCE: This study is a field study and was not conducted under GLPs according to 40 CFR §160. A non-compliance statement was signed by the author/sponsor/submitter.

SUMMARY: Test plots were treated with DADS at the 6-inch depth using a single, pressurized shank at a rate of 143 oz/A (1.12x the maximum

label rate) in a total application volume of 59.7 gal/A, with (Treatment 2) and without (Treatment 3) irrigation; Treatment 1 was the untreated control. Soil cores (1.75-inch x 12-inch) were collected at 0, 1, 3, 5, 7, 14, and 21 days after treatment (DAT). At each sampling interval, a pair of cores were collected at 0-, 2-, 4-, 6-, 8-, 10-, and 12-inches from the treatment line. Samples (2-inch increments) were analyzed using a purge/trap GC/MS method using an internal standard. At 1 DAT, soil cores collected from the non-irrigated and irrigated (Treatments 2 and 3, respectively) did not have any detectable (<5.0 ppb) DADS residues. Residues were also undetectable in the untreated control analyzed at 0 DAT. Due to the lack of detectable residues at 1 DAT, no other soil cores were analyzed. No sample storage stability data were submitted.

#### CONCLUSION:

Based on the data, residues of DADS in soil are non-detectable at 1 DAT following treatment at 1.12x. Since no samples from treated plots were analyzed at 0 DAT, it is not known if any detectable residues were present at 0 DAT. Furthermore, no sample storage stability data (duration of time from sample collection to sample analysis); thus, it is not known if the aforementioned data are reliable. Additionally, the apparent rapid dissipation of the active ingredient is not consistent with the reported physical/chemical properties data reported for boiling point (176°C) and vapor pressure [9 mm Hg at 20°C (see product chemistry DER)]; these data demonstrate that the TGAI is less volatile than water. Therefore, BPB does not concur with the registrant's conclusion that DADS residues were nondetectable at 0 DAT - no data were available to support that statement.

#### CLASSIFICATION:

Unacceptable. In addition to the deficiencies described above, submissions regarding field studies (environmental fate and effects, efficacy, etc.) information that more completely describes the geographic location of the test site, the soil type name, equipment used for analytical methods, and any validation data summaries (used to assure the precision and accuracy of the method in a soil matrix) must be submitted.

- I. Test Objective: Evaluate the vertical and lateral movement of DADS through the soil profile when applied according to normal agricultural practices.

## II. Materials and Methods: Field

Test Site: On a field not previously cropped with onions; geographical location not specified.  
 Test Substance: DADS end-use product; contains 90% active ingredient.  
 Equipment: Single row fertilizer shank mounted on a cultivator bar; compressed air used as a propellant.  
 Application Date/Time: 5/23/1994; 10:03 AM  
 Application Method: Product shanked into soil at 6-in depth in total volume of 59.7 gal/A. Soil was "sealed" with a roller immediately after treatment.  
 Application Rates: Treatment 1: Untreated;  
 Treatment 2: 143 oz/A (1.12 gal/A or 9.27 lbs a.i./A; 1.12x the maximum label rate based on total product application);  
 Treatment 3: 143 oz/A with supplemental irrigation  
 Application Depth: 6-inches  
 Air Temperature: 68°F at time of application.  
 Plot Preparation: Prior to product application, test plots were cultivated to a 12-inch depth and mulched according to standard agricultural practice.  
 Soil Texture: Sandy clay loam  
 Soil Temperature: 58°F at 6-inch depth at time of application; 55-71°F throughout sampling period.  
 Soil Moisture: 50-70% field capacity at time of application.  
 Irrigation: Treatment 2 did not receive additional irrigation throughout sampling period; Treatment 3 was irrigated with 0.5-inches of water on 6/8/1994. All test plots received 1.25-inches of natural rainfall during the sampling period.  
 Soil Samples: 1.75-inch x 12-inch soil cores were collected with "zero-contamination" acetate sleeves.  
 Sampling Method: Two sets of samples taken from each treatment as follows:  
 Treatment 1: soil cores collected from center of plot;  
 Treatments 2 and 3: six cores collected as follows:  
 S1: On treatment line;  
 S2: 2-inches from treatment line;  
 S3: 4-inches from treatment line;  
 S4: 6-inches from treatment line;  
 S5: 8-inches from treatment line;  
 S6: 10-inches from treatment line; and  
 S7: 12-inches from treatment line  
 Sample Intervals: 0, 1, 3, 5, 7, 14, and 21 days after treatment (DAT)

Sample Handling: After collection, soil cores were capped and immediately stored in coolers with dry ice. Soil cores remained in coolers until frozen and then transferred to freezers for storage until analysis; temp. range = 0 to -16°F (mean = -11°F). Freezer temp at analytical lab = -26°F.

### III. Materials and Methods: Laboratory

Sample Preparation: Immediately prior to analysis, each soil core was removed from its acetate sleeve and sectioned into 2-inch segments, centered at 6-inches. The central segment was labeled A, inner adjoining segments were labeled C, and the outside adjoining segments were labeled B. Top and bottom segments of A, B, and C were further labeled as t and b, respectively (e. g. At or Ab).

Sample Analysis: From each sample, 5 g of soil were collected and dosed with internal standards (fluorobenzene and 1, 4-dichlorobenzene-d<sub>4</sub>; concentrations not specified). To each sample was added 5 mL of reagent water and then the samples were purged with inert gas (unspecified). The purged gas was trapped on a porous polymer (unspecified) where it was desorbed onto a GC column (unspecified) for separation into a mass spectrometer (quadrupole, full mass range). DADS were identified based on a comparison of its unique mass spectra with an authentic reference standard (obtained from the National Bureau of Standards), and its GC retention time relative to the analytical reference standard. Quantitation was accomplished by an internal standard technique. Bromofluorobenzene was used as a system monitoring compound. The analytical method has a detection limit of 5.0 µg/kg (5 ppb). The detection limit and purging efficiency of DADS was determined prior to analysis using control test soil.

### IV. Results

The following core samples were analyzed: 0 DAT (Treatment 1), 1 DAT (Treatment 2), and 1 DAT (Treatment 3). The remaining soil cores were not analyzed due to non-detection of DADS (<5.0 ppb) in the aforementioned soil cores (see MRID 454892-01, p. 17 for Table of results). Based on the data, at 1 DAT there were no detectable residues of DADS in soils treated at the 6-inch depth with end-use product at 1.12x the maximum label rate. There was no apparent effect of irrigation. Mass spectra were presented for all analyses.

## V. Conclusions

Residues of DADS apparently dissipate to non-detectable ( $<5.0$  ppb) levels in sandy clay loam soil by 1 day following treatment with end-use product at 1.12x the maximum label rate. However, since no samples from treated plots were analyzed at 0 DAT, it is not known if any detectable residues were present at 0 DAT. Additionally, no sample storage stability data (duration of time from sample collection to sample analysis). Therefore, it is not known if the aforementioned data are reliable (see also Conclusion 4a and 4b above). The apparent rapid dissipation of the active ingredient is not consistent with the reported physical/chemical properties data (see product chemistry DER) reported for boiling point and vapor pressure.

## MEMORANDUM

**SUBJECT:** Science Review in Support of Registration and an Exemption From the Requirement of a Tolerance for Alli-Up™ White Rot Control Soil Fumigant (EPA File Symbol No. 034704-IGI), Containing 90% Diallyl Sulfides [a mixture of 8.90% diallyl monosulfide, 86.90% diallyl disulfide, 3.90% diallyl trisulfide, and 0.30% diallyl tetrasulfide (DADs); Chemical No. 129087] as a New Active Ingredient. Review of Environmental Fate Data/Information. DP Barcode D286023; Case No. 070603; Submission No. S623076; No MRID Nos.

**FROM:** Russell S. Jones, Ph.D., Biologist  
Biochemical Pesticides Branch  
Biopesticide & Pollution Prevention Division (7511C)

**TO:** Driss Benmhend, Regulatory Action Leader  
Biochemical Pesticides Branch  
Biopesticide & Pollution Prevention Division (7511C)

## ACTION REQUESTED

In response to a request for additional information (see Memorandum from R. S. Jones to D. Benmhend, dated 01/31/2002), Platte Chemical Co. submitted environmental fate data pertaining to the end-use product, Alli-Up™ White Rot Control Soil Fumigant (EPA File Symbol No. 034704-IGI). The product contains 90% diallyl disulfides [a mixture of 8.90% diallyl monosulfide, 86.90% diallyl disulfide, 3.90% diallyl trisulfide, and 0.30% diallyl tetrasulfide (DADs); Chemical No. 129087] as a new active ingredient. The end-use product is intended for food use as soil fumigant to control white rot (*Sclerotium cepivorum*) in onions, garlic, and leeks.

## CONCLUSIONS AND RECOMMENDATIONS FOR REGISTRATION

The submitted environmental fate data are acceptable and demonstrate that DADs residues rapidly dissipate from and/or are rapidly bound to the soil via three soil physico-chemical mechanisms: high soil pH, oxidation of sulphur moieties, and/or catalysis. No additional environmental fate and product chemistry data are required to support registration of Alli-Up™ White Rot Control Soil Fumigant (EPA File Symbol No. 034704-IGI).

## BACKGROUND

In an earlier review of data/information submitted in support of the registration of Alli-Up™ White Rot Control Soil Fumigant (EPA File Symbol No. 034704-IGI; containing 90% diallyl disulfides as its active ingredient), BPPD determined that a non-guideline terrestrial soil dissipation study (MRID 454892-01) was unacceptable (see Memorandum from R. S. Jones to D. Benmhend, dated 01/31/2002) due to: (i) deficiencies in methodology and sample handling that invalidated conclusions made by the registrant (see letter from B. Riggle to S. Reilly, dated 11/19/2002); and (ii) certain product chemistry information (e.g. volatility) that did not support the results of the terrestrial dissipation study or label claims regarding the volatility and rapid dissipation of the product following application (see letter from B. Riggle to S. Reilly, dated 11/19/2002). Specifically, BPPD requested that the registrant (Platte Chemical Co.) reconcile the supposedly rapid dissipation of product from soil following application, with product chemistry data indicating that the boiling point (176 °C) was unusually high, and the vapor pressure (9-mm Hg) was unusually low for a product that would rapidly dissipate. At meeting with BPPD staff (dated 7/17/2002), the registrant was informed that if the aforementioned deficiencies could be resolved, BPPD would not require a new terrestrial soil dissipation study nor would it require a soil adsorption/desorption study.

To resolve the apparently contradictory data/information, the registrant responded with a letter to the Agency (letter from B. Riggle to S. Reilly, dated 11/19/2002) containing four attachments. The attachments addressed three mechanisms whereby DADs residues in soils could be broken down and dissipated by abiotic means, even in frozen (-24°C) soil samples. According to the registrant's summary, DADs residues in soils stored at temperatures (e.g. -24°C) that preclude microbial metabolism *"can break down under three potential mechanisms and the breakdown products are in turn subject to adsorption to soil organic matter/clay colloids. These potential breakdown mechanisms include (a) soil pH, (b) oxidation, and (c) clay/metal catalysis."* The three mechanisms are summarized briefly on page 2 of the aforementioned letter (attached); for details, see photocopies of attachments provided by the registrant at the end of this document.

According to the registrant's summary, "A combination of the described mechanisms and the adsorption of breakdown byproducts to soil particles would have resulted in a complete reduction of DADs residues in frozen soil cores." Additionally, *"the components of DADs are highly reactive due to the sulfide groups and the absorptive properties of the soil. The absence of any sulfide odor or odors associated with diallyl sulfides from the test soils [of the aforementioned terrestrial soil dissipation study] provided further evidence that adsorption had occurred."* Based on the submitted data/information, the registrant hypothesized that DADs residues in the frozen soil cores (obtained from the aforementioned soil terrestrial dissipation study) were rapidly degraded to non-detectable

levels (i.e. <5 ppb) via a number of abiotic soil chemical reactions and that the degradation products were rapidly adsorbed and further degraded by reactions on catalytic sites on the soil clay particles. BPPD concurs with the registrant's hypothesis. Based on the submitted data/information, DADs residues are highly reactive sulfur compounds that degrade rapidly in soil, even at low temperatures where biodegradation pathways are not likely to be active. An additional terrestrial soil dissipation study and a soil adsorption/desorption study are no longer required by the Agency for registration of Alli-Up™ White Rot Control Soil Fumigant (EPA File Symbol No. 034704-IGI).

cc: R. S. Jones, D. Benmhend, BPPD Subject File  
R. S. Jones: F T CM2, (703) 308-5071: 10/15/2002





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R134962

**Chemical:** Disulfide, di-2-propenyl

**PC Code:**  
129087

**HED File Code:** 41300 BPPD Eco Effects

**Memo Date:** 12/5/2001

**File ID:** DPD277846

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**Accession #:** 000-00-9001

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